

Ein Unternehmen der Metabo-Gruppe

- Ⓓ Betriebsanleitung
Schweißgeräte mit stufenloser Regelung
- Ⓔ Operating Instructions
Welding Transformers and Rectifiers
with Stepless Current Control
- Ⓕ Instructions d'utilisation
Appareil de soudure avec réglage en continu
- Ⓖ Handleiding
Lasapparaten met traploze instelling

English only

SB 160 C / SB 200 CT



D DEUTSCH**KONFORMITÄTSERKLÄRUNG**

Wir erklären in alleiniger Verantwortlichkeit, daß dieses Produkt mit den folgenden Normen übereinstimmt* gemäß den Bestimmungen der Richtlinien**.

F FRANÇAIS**DECLARATION DE CONFORMITE**

Nous déclarons, sous notre seule responsabilité, que ce produit est en conformité avec les normes ou documents normatifs suivants* en vertu des dispositions des directives**

IT ITALIANO**DICHIARAZIONE DI CONFORMITÀ**

Noi dichiariamo sotto la nostra esclusiva responsabilità che il presente prodotto è conforme alle seguenti norme*. in conformità con le disposizioni delle normative**

PT PORTUGUÊS**DECLARAÇÃO DE CONFORMIDADE**

Declaramos sob nossa responsabilidade que este produto está de acordo com as seguintes normas*.de acordo com as directrizes dos regulamentos**

FIN SUOMI**VAATIMUKSEN MUKAISUUSVAKUUTUS**

Vakuutamme, että tämä tuote vastaa seuraavia normeja*.on direktiivien määräysten mukainen**

DA DANSK**OVERENSSTEMMELSE ATTEST**

Hermed erklærer vi på eget ansvar, at dette produkt stemmer overens med følgende standarder*. iht. bestemmelserne i direktiverne**

EL ΕΛΛΗΝΙΚΑ**ΔΗΛΩΣΗ ΑΝΤΙΣΤΟΙΧΕΙΑΣ**

Δηλώνουμε με ίδια ευθύνη ότι το προϊόν αυτό αντιστοιχεί στις ακόλουθες προδιαγραφές* σύμφωνα με τις διατάξεις των οδηγιών**

ENG ENGLISH**DECLARATION OF CONFORMITY**

We herewith declare in our sole responsibility that this product complies with the following standards* in accordance with the regulations of the undermentioned Directives**

NL NEDERLANDS**CONFORMITEITSVERKLARING**

Wij verklaren als enige verantwoordelijke, dat dit product in overeenstemming is met de volgende normen* conform de bepalingen van de richtlijnen**

ES ESPAÑOL**DECLARACION DE CONFORMIDAD**

Declaramos bajo nuestra exclusiva responsabilidad, que el presente producto cumple con las siguientes normas*.de acuerdo a lo dispuesto en las directrices**

SV SVENSKA**FÖRSÄKRAN OM ÖVERENSSTÄMMELSE**

Vi försäkrar på eget ansvar att denna produkt överensstämmer med följande standarder*. Enligt bestämmelserna i direktiven**

NO NORGE**SAMSVARERKLÆRING**

Vi erklærer under eget ansvar at dette produkt samsvarer med følgende normer*. henhold til bestemmelsene i direktiv**

POL POLSKI**OŚWIADCZENIE O ZGODNOŚCI**

Oświadczamy z pełną odpowiedzialnością, że niniejszy produkt odpowiada wymogom następujących norm*.według ustaleń wytycznych**

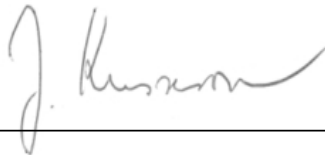
HU MAGYAR**MEGEGYEZŐSÉGI NYILATKOZAT**

Kizárólagos felelősségünk tudatában ezennel igazoljuk, hogy ez a termék kielégíti az alábbi szabványokban lefektetett követelményeket*.megfelel az alábbi irányelvek előírásainak**

SB 160 C - SB 200 CT

* EN 50060; EN 55014 (1993); DIN EN 61000-4-1 (1993), EN 60974-1

** 89/336/EWG, 73/23/EWG



Dipl. Ing. Jürgen Kusserow

Vorstand



ELEKTRA BECKUM AG – Daimlerstraße 1 – 49716 Meppen

Tel.: +49 59 33 80 20

1000965/00

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You have bought a high-quality electric arc welding machine, designed and built by specialists with many years of experience. A machine built to last, giving a long service life.

All models have the correct size power supply cable fitted, the transformer's core is made from top-quality insulated sheet steel, to keep eddy currents and cyclic magnetization losses to an absolute minimum.

Please read the instructions given in the manual in order to fully utilize the potential of your machine.

Know and adhere to all local safety codes and regulations governing the operation of electric arc welding machines.

User Responsibility

The operation of the welding device in the data processing system environment is not allowed!

This product shall only be used as specified. Any other use requires the written consent of Elektra Beckum AG, P.O.Box 1352, D-49703 Meppen, Germany

Please contact your dealer for any warranty claims.

Warranty work will essentially be carried out by service centres authorised by us. Repairs beyond the warranty period may be carried out only by our authorised service centres.

Please preserve all repair invoices! We reserve the right to make technical changes!

We recommend attending a welding course at a recognised technical institute.

1 Specifications

Model	SB 160 C	SB 200 CT	SB 200 CT
Main voltage	230/400 V	240 V	230/400 V
Mains frequency	50/60 Hz	50 Hz	50/60 Hz
Welding steps	stepless	stepless	stepless
Stepless at 230 V	32 - 38 V	47 - 55 V	31 - 39 V
Stepless at 400 V	38 - 46 V		41 - 50 V
Max. OCV at 230 V	16 A time-lag	32 A time-lag	16 A time-lag
Max. OCV at 400 V	16 A time-lag		20 A time-lag
Insulation class	H	H	H
Protection class	IP 21	IP 21	IP 21
Setting range, stepless 230 V	30 - 110 A	70 - 180 A	20 - 110 A
Setting range, stepless 400 V	65 - 155 A		60 - 180 A
Cooling	self	fan	fan
Weldable electrodes at 230 V	Ø 1.6 - 2.5 mm	Ø 2,0 - 4,0 mm	Ø 1.6 - 2.5 mm
Weldable electrodes at 400 V	Ø 2.0 - 3.25 mm		Ø 2.0 - 4.0 mm

2 Taking a Single-Phase Machine into Operation

This machine is to be connected to the power mains via a Earth Fault Circuit Interrupter of 30 mA capacity. Worn or damaged power cables should be replaced immediately by a qualified electrician.

Do not operate this machine with a damaged power cable, danger of personal injury by electric shock.

Children are not permitted to operate this machine.

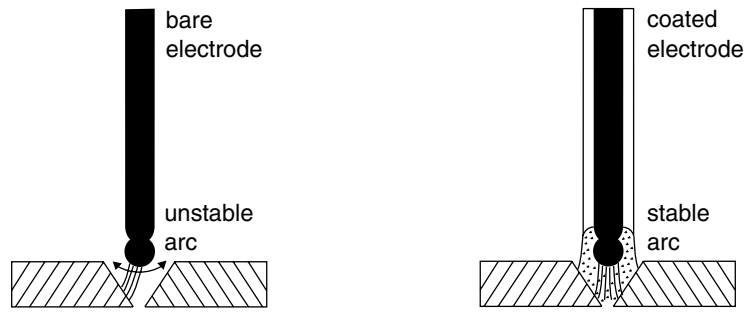
Connect to an earthed single-phase 230/240 V outlet, protected by a 16 A time-lag fuse. Operating other electric machines or appliances on the same circuit while welding is only possible to a very limited extent and not recommended.

Earth and welding cable are firmly attached to the machine.

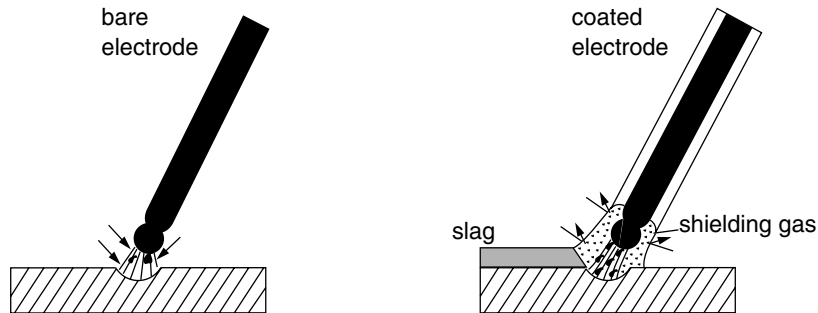
Polarity does not matter with AC welding current.

3.1.2 Function of the Stick Electrode Coating

Stabilization of the arc and ionization of the arc space



Protection of the weld metal from atmospheric oxygen and nitrogen

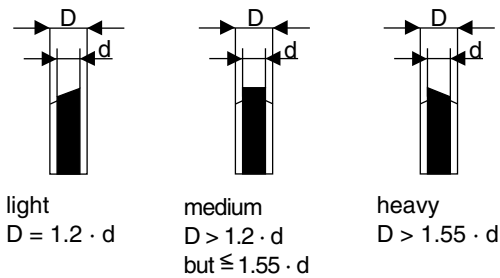


This protection is achieved by the generation of shielding gases and slag during the melting of the electrode.

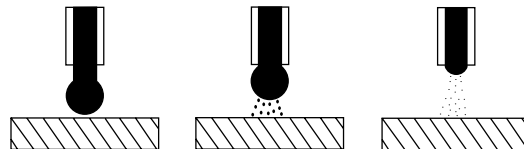
Compensation of alloy burn-off.

Stick Electrodes According to DIN 1913

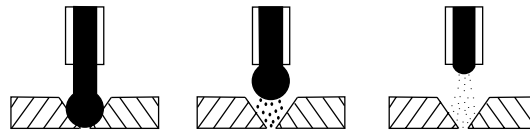
Coating thickness



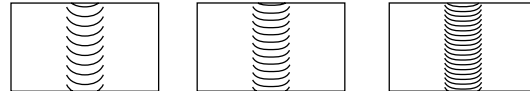
Material transfer



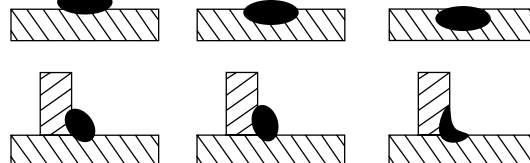
Gap bridging ability



Weld seam appearance



Penetration depth



Types of Coating

A	acid coated	R(C)	rutile cellulose medium coating
R	rutile light and medium coating	RR(C)	rutile cellulose heavy coating
RR	rutile heavy coating	B	basic coating
AR	rutile acid coating	B(R)	basic coating with non-basic proportions
C	cellulose coating	RR(B)	rutile basic heavy coating

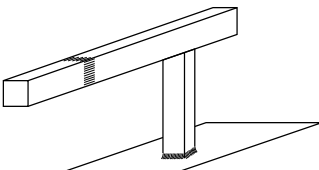
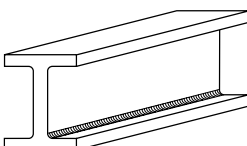
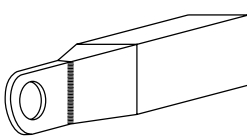
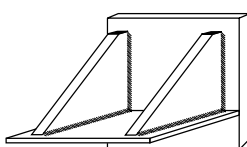
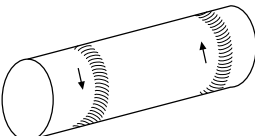
3.1.3 Classification of Stick Electrodes according to Table 3 of DIN 1913

Grade	Stick Electrode Type	Coating Thickness	Weld Position	
2	A 2	light	1	
	R 2			
3	R 3	medium	2 (1)	
	R(C) 3		1	
4	C 4			
5	RR 5	heavy	2	
	RR(C) 5		1	
6	RR 6		2	
	RR(C) 6		1	
7	A7		2	
	AR 7			
	RR(B) 7			
8	RR 8			
	RR(B) 8			
9	B 9		1	
	B(R) 9			
10	B 10		2	
	R(R) 10			
11	RR 11	(high-performance electrodes)	4 (3)	
	AR 11			
12	B 12			
	B(R) 12			

Code for Welding Position according to Table 4 of DIN 1913

Code	Weld Position	Code Letter For Welding Position
1	all	w, h, hü, s, f, q, ü
2	all except vertical-down	w, h, hü, s, q, ü
3	gravity position fillet weld	w
	gravity position horizontal	w h
	gravity position	w

3.1.4 Selecting suitable Electrodes for a Welding Task

Component	Welding Task	Stick Electrode Type
	out-of position welding of butt and fillet welds on thin-walled extrusion	RR 6 RR 8
	horizontal or gravity position fillet welds on long beams with "a" = 5 mm	RR 11 AR 11
	gravity position double-V welds on thick plate tow bars	B 10
	out-of-position fillet welds on bracket of 10 mm thick plate	RR(B) 7 RR(B) 8
	out-of-position butt welds on pipelines	weld 1: C 4

Stick electrodes can be classified according to their coating as under:

Type Code Type Coating Characteristics	Type of Slag - Slag Removal Ability	Penetration Depth - Gap Bridging Ability	Electrode Manipulation	Characteristics	Weld Appearance
O Bare Electrode finely distributed arc stabilizers in the electrode material	minimal slag	shallow - excellent	more difficult to weld than any other stick electrode	very high deposition rate, minimal heat stress, little heat distortion	convex, coarsely rippled
OO Flux-Core Electrode arc stabilizers rolled into the electrode's core	minimal slag	average to deep - excellent	slightly easier to weld than bare electrodes	good deposition rate, minimal heat stress, little weld distortion, especially for root welds	convex - coarsely rippled
N Titania Oxide Type high contents of titanium oxide	porous, even slag blanket - easily removed	average - good to excellent, depending on coating thickness	weldability of fillet welds improves with increasing coating thickness	general purpose electrodes, for steels sensitive to welding conditions, for thin plate	slightly convex to flat, finely to medium-coarsely rippled
Es Acid-Coated Type high contents of heavy metal oxides	porous, even slag blanket	deep - average	weldability of fillet welds improves with increasing coating thickness	for steels sensitive to welding conditions, requires good weld preparation	flat, finely rippled
Ox Iron Oxide Type high contents of iron oxides	tight slag blanket of evenly distributed thickness - very easily	shallow - very poor	good weldability, fillet welds in gravity position only	for unalloyed low-carbon steels, requires good weld preparation	concave, very finely rippled
Kb Basic Low-Hydrogen Type high contents of calcium or other alkaline carbonates	thick slag blanket - fair	medium - good	handling requires some practice, in particular when setting electrode to and removing from weld	particularly suitable for thick plate and rigid assemblies, for high-carbon steels, for thermo steels	slightly convex, medium-coarsely rippled
Ze Cellulose Type high contents of organic components	minimal, often quickly solidifying thin slag blanket - easy	deep - very good	good handling as only minimal slag, heavy fume generation	for out-of-position welding	slightly convex, rippled

In addition to the electrodes types shown in the above table there are several special types available coded SO. Cast iron electrodes, for example, fall into this class.

When buying Kb and So type electrodes make sure they are suitable for AC current. As far as the quality grades are concerned, a higher number indicates a better grade quality. For common low-carbon steels grades 7 - 9 are best suitable.

The last letter of the code shown on the stick electrode indicates the coating thickness.

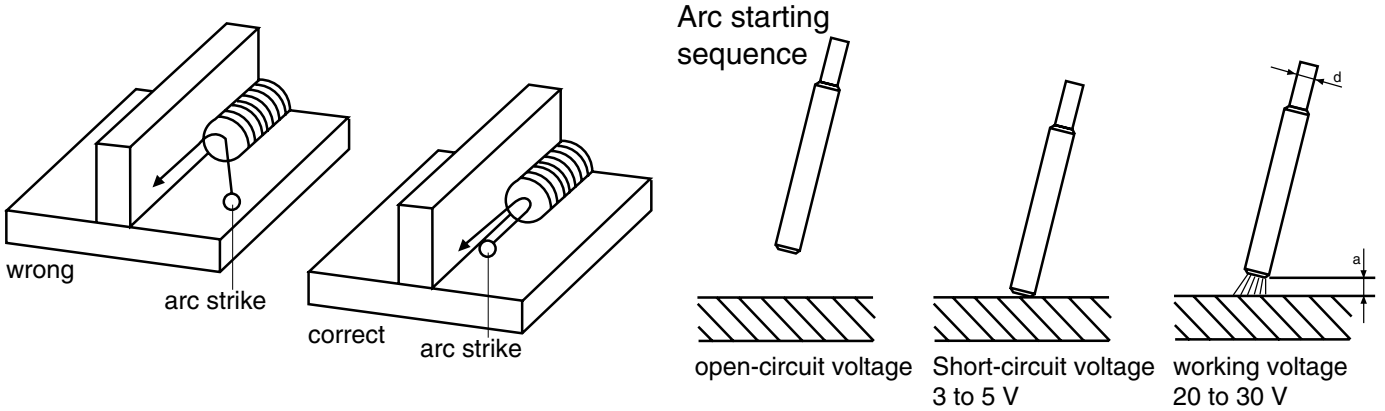
d = light coating
m = medium coating
s = heavy coating

3.1.5 Arc Starting and Arc Burning

Arc Strike

Always start the arc in the welding groove.

When the arc is stable weld over the arc strike and melt for good fusion, otherwise there is a risk of cracking.



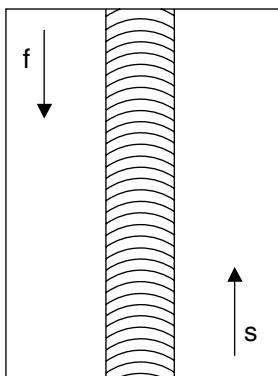
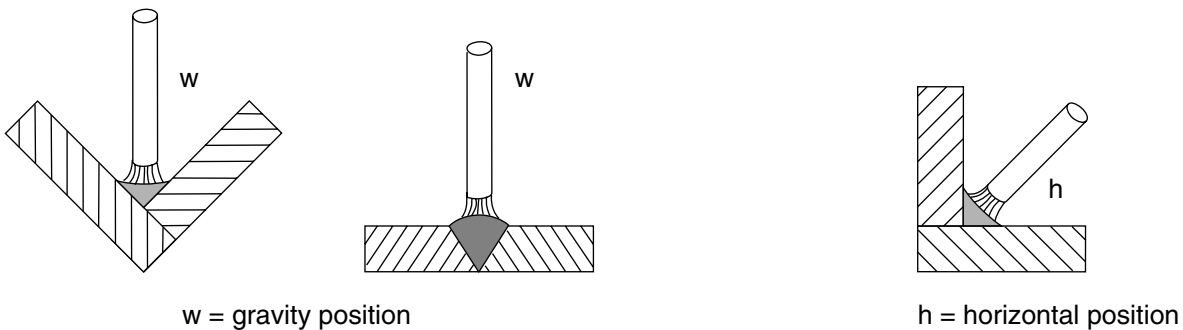
Arc Length

The arc length "a", that is the distance between the stick electrode and the work, should be:

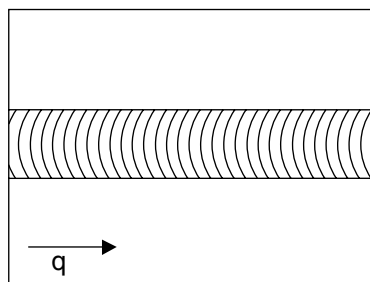
- with stick electrodes of coating type R, RR, A, C = 1.0xd,
- with stick electrodes of coating type B = 0.5xd,

Too long an arc reduces the penetration, increases the arc blow effect and, particularly with basic coated stick electrodes, causes a porous weld seam.

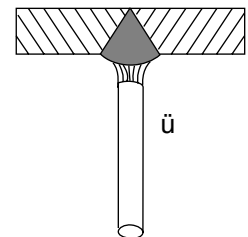
3.1.6 Welding Positions According to DIN 1921



s = vertical-up position
f = vertical-down position



q = horizontal-vertical position

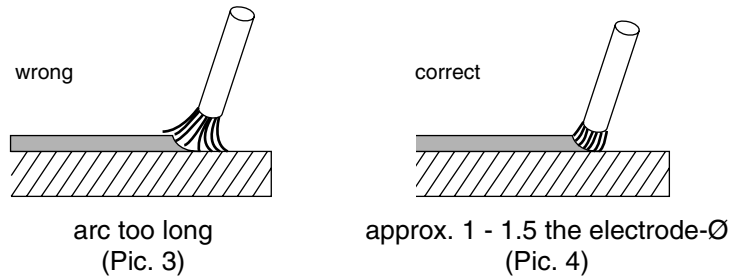


ü = overhead position

4 Welding Hints

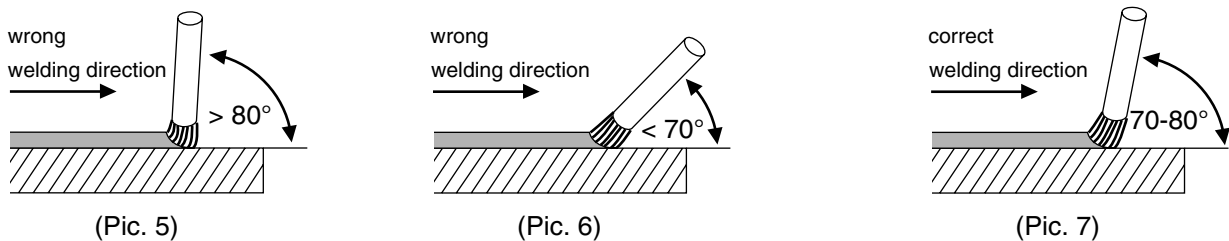
Because of the multitude of and great differences in the important points for welding only the very basic operations for the most common electrodes for low-carbon steels, the Ti-type electrode, are introduced here. In the case that other electrodes have to be used, the electrode manufacturers supply upon request all relevant information for the type of special electrode to be used.

Always make some trial welds on scrap material. Select electrode diameter and welding current as per Table 1. Attach earth clamp to work piece and place electrode into electrode holder as described earlier. Now hold the electrode tip approx. 2 cm / 1 inch above the starting point of your welding seam. Hold the welding shield in front of your face and draw the electrode with a short stroke along the groove. Through the welding shield you watch the arc, keeping it to a length of 1 to 1.5 times the electrode diameter.



The correct arc length is important for a good weld, because with too short or too long an arc both welding current and working voltage change. A low working voltage causes insufficient penetration. Too high or too low welding current gives a poor welding seam. Too long an arc does not sufficiently melt the parent material, resulting in high spatter losses. Also the air, with its detrimental substances like hydrogen and nitrogen, may get access to the weld pool.

For a good weld the work angle of the electrode (or electrode inclination angle) is of substantial importance. The inclination should be $70^\circ - 80^\circ$ to the welding direction. With the work angle too steep slag will run under the weld pool, too flat an work angle causes the arc to spatter, in both cases the result is a porous, weak welding seam (see pictures 5 - 7).



The welder has to keep the arc at the same length, that is the electrode burn-off is compensated by feeding the electrode into the weld. At the same time the welder has to watch the weld pool for even penetration and width. Welding is always done from left to right (backhand welding).

At the end of the welding seam the electrode can not simply be lifted or pulled from the weld, this creates porous end craters, which weaken the weld. To correctly terminate a weld the electrode is held for a short moment at the end of the weld seam, then lifted in an arc over the just laid weld.



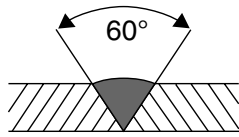
Remove slag only after it has cooled down and is no longer glowing.

If an interrupted weld is to be continued, the slag at the end of the already finished weld must be removed. Then the arc can be started either in the groove or on the weld, as described earlier, and then moved to the end of the weld, which has to be thoroughly melted for good fusion. Welding is then continued normally.

4.1 Weld Types

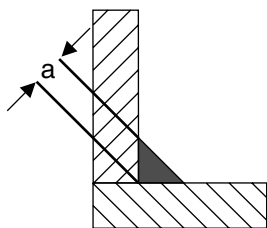
For **Butt Welds** the work piece edges should be bevelled to approx. 30° , which gives a groove angle of 60° (Pic. 10).

The root opening between the two work pieces should be 2 - 3 mm.



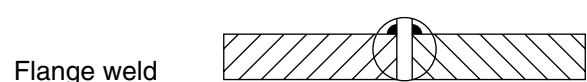
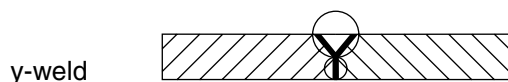
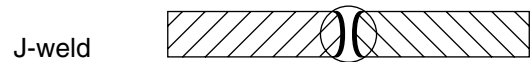
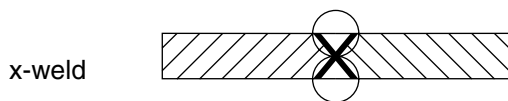
(Pic. 10)

For **Fillet Welds** "a" is the throat width size. The throat width should be at least $\times 0.7$ the plate thickness of the thinner plate.

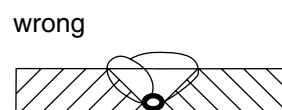


(Pic. 11)

Other weld types:



A joint weld must always have a good fusion at the root.



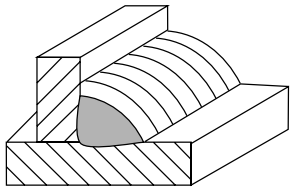
(Pic. 12)



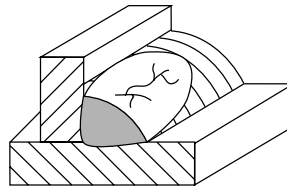
(Pic. 13)

Let weld cool down in the ambient air, do not quench.

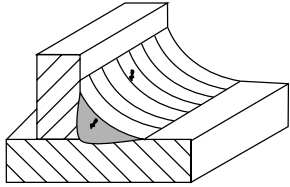
4.2 Weld Flaws and possible Causes - Shown on Fillet Welds



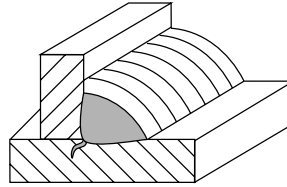
Weld Undercut
 Welding current too high
 Electrode work angle too steep
 Arc too long



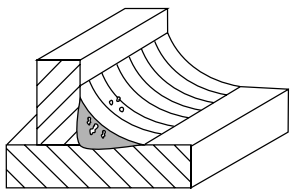
End Crater
 Electrode removed too quickly from the weld pool, particularly with high welding currents risk of shrinkage cracking



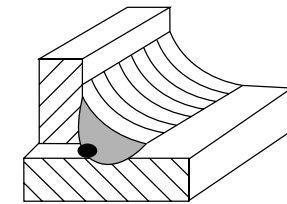
Slag Inclusion
 Welding current too low
 Welding speed too high
 Welding over slag on multi-layer welds



Weld Toe Cracks
 Material sensitive to welding conditions
 Weld cooled down too fast after welding



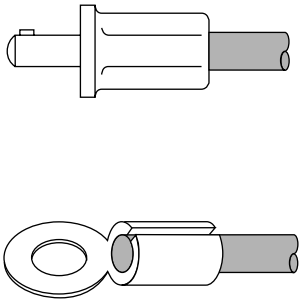
Gas Inclusion
 Work surface not clean (rust, grease, paint)
 Arc too long
 Basic coated electrodes not sufficiently dried



Root Flaw
 Slag entering root area because distance too great

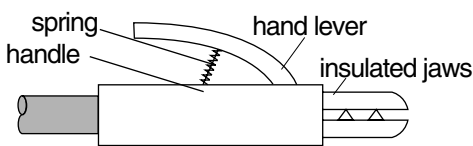
5 Accessories and Accessory Maintenance

Connecting Welding Cables to the Welding Power Source



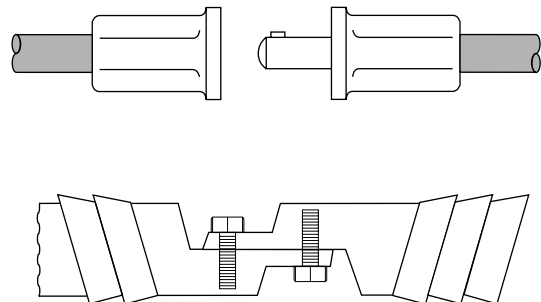
Ring tongue terminal soldered, crimped, clamped

Fully Insulated Electrode Holder



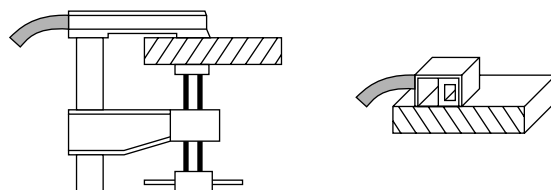
Replace broken insulating parts at once!

Connecting (Extending) Welding Cables



Insulate screw joint terminal with rubber bush or heat-shrinkable sleeve

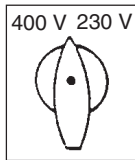
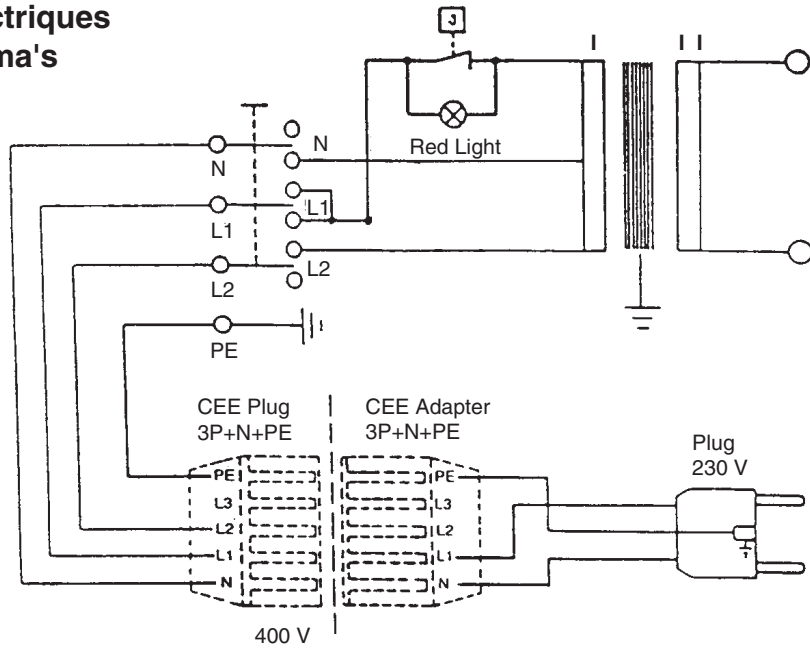
Connection of Welding Cables to the Work Piece



Clean work piece surface for good conduction

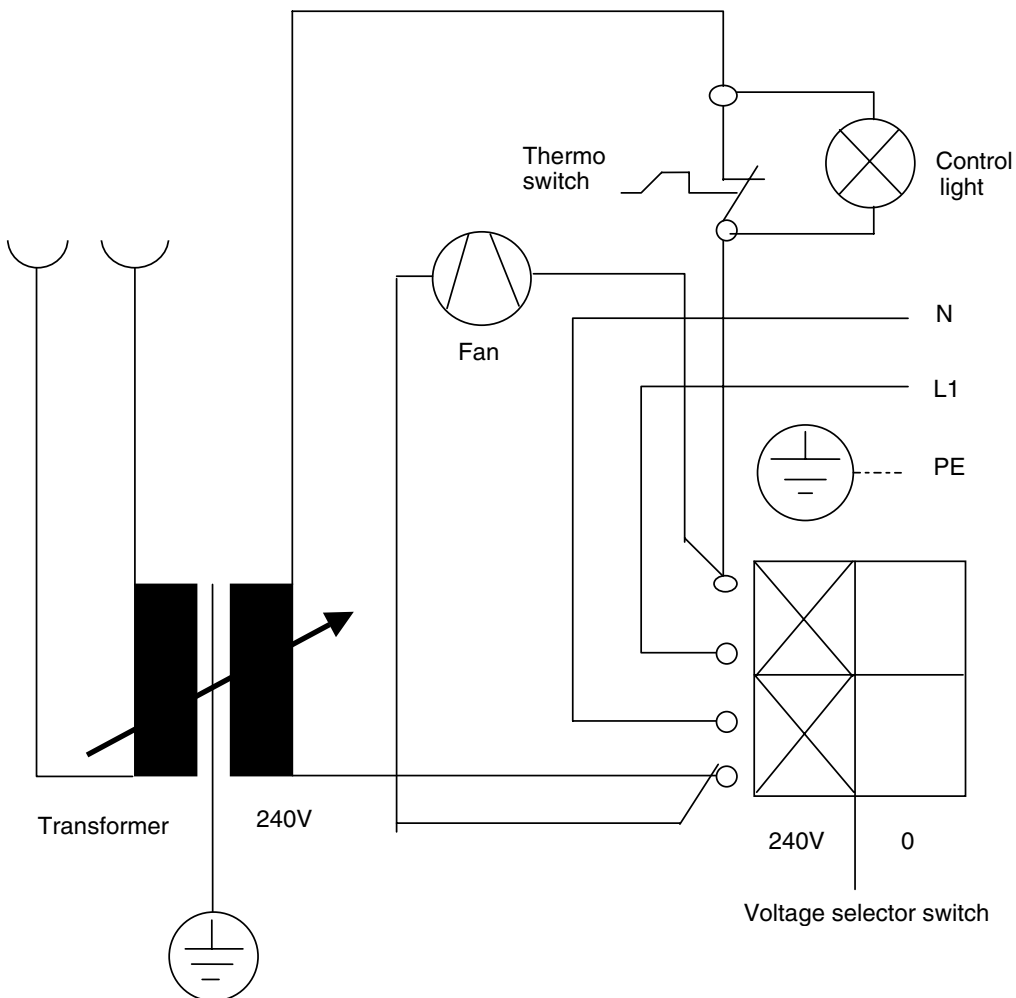
Attach earth clamp as close as possible to the weld. Structural components, beams, pipes or rails should not be used for earth conducting if they are not the actual work piece.

- 6 Wiring Diagrams
- 6 Schaltpläne
- 6 Schémas électriques
- 6 Schakelschema's

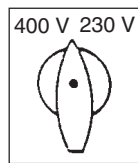
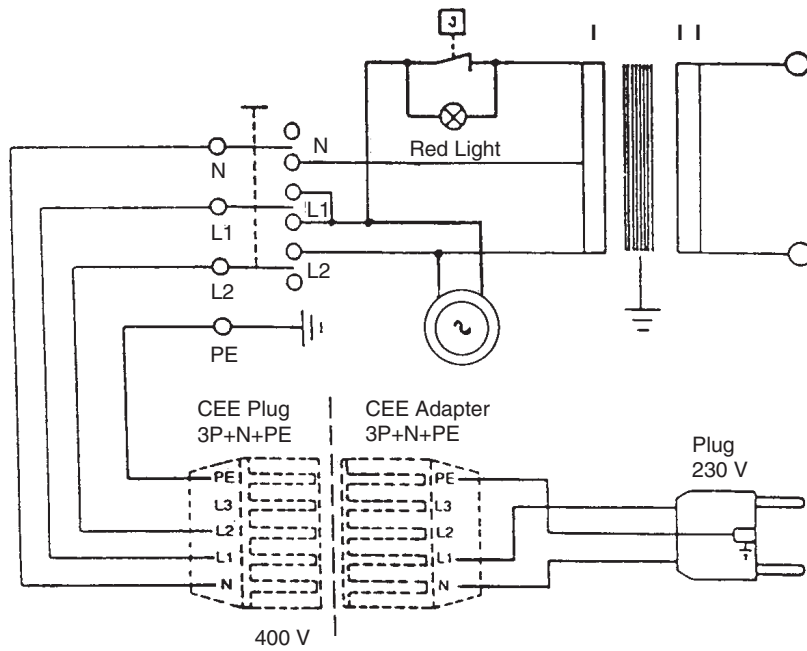


Contacts	Schwitch Positions		
	400 V	0	230 V
N - N	On	ON	OFF
L1 - L1	OFF	ON	OFF
L2 - L2	OFF	ON	ON

SB 160 C (230/400 V)



SB 200 CT (240 V)



Contacts	Switch Positions		
	400 V	0	230 V
N - N	On	ON	OFF
L1 - L1	OFF	ON	OFF
L2 - L2	OFF	ON	ON

SB 200 CT (230/400 V)

Ein Unternehmen der Metabo-Gruppe

Country: Company: Address 1: Address 2: City: Phone: Fax: E-mail
Albania: Extra Industrial Goods; Ri. Fadil Rada 88; ; Tirana; (+355) 42 - 3 30 62; abeqiri@t-online.de
Algerie: Haddad Equipement Professionne; 98 A, Site du Lycée; ; 16012 Rouiba; (+213) 21 - 85 49 05; (+213) 21 - 85 57 72;
Argentina: Metabo Argentina S.A.; Teniente Gral. Richieri 4773; ; 1702 - Ciudadela - Buenos Aires; (+54) 11 - 44 88 - 9180; (+54) 11 - 44 88 - 39 89; info@metabo.com.ar
Australia: Metabo Pty. Ltd.; 10 Dalmore Drive; ; Scoresby, Melbourne, Vic. 3179; (+61) 3 - 97 65 01 99; (+61) 3 - 97 65 01 89; sales@metabo.com.au
Bahrain: AL-MAHROOS; P.O. Box 65, Manama; ; Bahrain; (+973) 40 06 96; (+973) 40 43 23; almahros@batoel.com.bh
Bangladesh: East Bengal Impex; 175, Nawabpur Road (4th floor); ; Dhaka; ; (+880) 2 - 9 56 94 77 / 9 55 04 00;
Belgium: Metabo Belgium; €t Hbfveld 3 - 5; ; 1702 Groot Bilgaarden; (+32) 2 - 4 67 32 10; (+32) 2 - 4 66 75 28; general@metabo.be
Bosnia and Herzegovina: Agrarkombinat; Majevička 1; ; Banja Luka; (+387) 51 - 302 718; (+387) 51 - 785 708; agrokombinat@blic.net
Brazil: Metabo do Brasil Ltda.; Rua Guicurus 306 - Vila Conceicao; ; Diadema - Sao Paulo - Cep 09911-630; (+55) 11 - 40 51 - 25 11; (+55) 11 - 4056 - 4152; metabo@metabo.br
Ceska Republika: Metabo s.r.o.; Kralovicka 544; ; 250 01 Brandys nad Labem; (+420) 202 - 80 44 55; (+420) 202 - 80 44 56; mlanda@metabo.cz
Chile: Nordchil S.A.; San Diego 895; ; Santiago de Chile; (+56) 2 - 6 72 29 11; (+56) 2 - 6 99 04 85; empresa@nordchil.cl
Costa Rica: Capris S.A.; Frente la Imprenta Nacional, La Uruca; P.O. Box 7-2400; San José; (+506) 2 32 91 11; (+506) 2 32 93 53; webmaster@capris.co.cr
Cyprus: Med Marketing Ltd. (eurotools); P.O. Box 27017; 17, Digenis Akritas Ave; 1641 Lefkosa, Cyprus; (+357) 2 - 34 95 77; (+357) 2 - 34 93 94; condam@spidemet.com.cy
Danmark: Metabo Danmark A/S; Helgeshoj Allé 12; ; 2630 Tastrup; (+45) 43 - 31 34 00; (+45) 43 - 31 34 01; scarstensen@metabo.dk
Deutschland: Elektra-Beckum AG; Daimlerstr. 2; ; 49716 Meppen; 0180 - 3 33 34 56; 0180 - 3 33 34 57; Ersatzteilverkauf@elektra-beckum.de
Estland: A/S MECRO; Peterburi tee 44; ; 11415 Tallinn; (+372) 620 11 11; (+372) 620 11 12; mecro@meicro.ee
Egypt: EGYPTIAN ENGINEERING AGENCIES; 16 Naguib El-Rihani Street; ; Cairo; (+20) 2-25 91 32 77; (+20) 2-25 90 02 23; eea@eea.co.eg
El Salvador: Metabo S.A. de C.V.; Colonia Santa Clara, Pasaje C No. 20; Cuscatancingo; San Salvador; (+503) 2 - 38 47 65; (+503) 2 86 52 36; metabo1@telesal.net
España: Herramientas Metabo S.A.; Poligono Ind. Prado del Espino; C/Flojadores, 12; 28660 Boadilla del Monte (Madrid); (+34) 91 - 6 32 47 40; (+34) 91 - 6 32 41 47; wbuhrle@metabo.es
Ethiopia: SUTCO Pvt. Ltd. Co.; P.O. Box 17924; ; Addis Ababa; (+251) 1-51 27 58; (+251) 1-51 50 82; sutco@telecom.net.et
Finland: NOFA O.Y.; Hannuksentie 1; O.O. Box 28; ; 02270 Espoo; (+358) 9-804861; (+358) 9 - 803 9485; reijo.helenius@nofa.fi
France: LUREM MACHINES A BOIS S.A.; BP 1; ; 61700 Dormfront; (+33) 2 33 57 19; (+33) 2 33 37 72 25;
Ghana: Emmock Tradingcompany Ltd.; Knutsford. Avenue opp. Morocco House; P.O. Box 1783; Accra; (+233) 21 - 66 39 94; (+233) 21 - 78 02 90;

Polisa; Metabo Polska Sp. z o.o.; Gdynska 28; ; 73-110 Stargard Szczecinski; (+48) 91 - 5 78 11 95; (+48) 91 - 5 78 07 76; servis@metabo.pl
Portugal: BOLOS-Mag. e Ferramentas de Qualidade, S.A.; Rua B, Lotes 8-10-12; Apartado 53; 7000-171 Evora Codex; (+351) 266 - 74 93 00; (+351) 266 - 74 93 09; bolas@mail.telepac.pt
Qatar: Gulf Incon; P.O.Box 4076; ; Doha; (+974) 4 68 35 11; (+974) 4 68 40 65; ganes@ulfincon.com
Rep. de Panam.; G erman-Tec (Panam.) S.A.; Via Argentina 46-70; Apartado 342, Zona 9-A; Panam.; (+507) 2 23 77 05; (+507) 2 69 18 66; germante@cableonda.net
Republic of South Africa: Metabo Power Tools SA (Pty.) Ltd.; 165 Van DER BIJL STREET; MEADOWDALE - Germiston; Johannesburg; (+27) 11 - 372 - 96 00; (+27) 11 - 453-41 63; ebotha@metabo.co.za
República Dominicana: Agroindustrial Ferreira S.A.; Av. Luperon No. 42; ; Santo Domingo; (+1) 809 - 531 50 80; (+1) 809 - 531 53 38; jgarcia@agroindustrialferreira.com
Rumania: Agent Trade S.R.L.; Splaiul Unirii 235-237; ; 74299 Bucuresti 3; (+40) 1 - 3 20 31 41; (+40) 1 - 3 20 31 42; agent@diak.kappa.ro
Russia; OOO ITA-Strojnkom; Uliza Alabjiana 3; ; 125057 Moskau; (+7) 095 - 198 43 14/198 17 13; (+7) 095 - 198 43 14; metabo_service@mail.ru
Schweiz: Metabo (Schweiz) AG; Lindauerstr. 17; ; 8317 Tagelswangen; (+41) 52 - 3 54 34 44; (+41) 52 - 3 54 34 45; service@metabo.ch
Singapore: HOMELY HARDWARE PTE LTD; No. 1 Ubi Crescent #01-01; Number One Building, Singapore 408563; (+65) 7 48 28 66; (+65) 7 45 38 72; sales@homely.com.sg
Slovenia; Dilex d.o.o.; Ogrinceva 17; ; 1000 Ljubljana; (+386) 61 - 1 68 16 20; (+386) 61 - 1 68 16 16; metabo@dllex.si
South Korea; Metabo-Korea Co. Ltd.; Room No. 101, Daesung Building; 263-1 Ipchung-Dong, Chung-Gu; Seoul; (+82) 2 - 22 76 09 14/5; (+82) 2 - 2 78 62 62; kwlee@metabokorea.co.kr
St. Lucia: Eurotools Int'l Ltd; P.O.Box RB 2484; Rodney Bay, Gros Islet, West Indies; Santa Lucia; (+1) 758 - 452-99 14; (+1) 758 - 452-99 15; eurotools@candw.Lc
Sultanate of Oman: AHMED RAMADHAN JUMA & CO.L.L.C.; P.O. Box 3566; Postal Code 112; Ruwi; (+968) 70 31 70; (+968) 70 83 05; sjuma@email.com
Sverige; Metabo Sverige AB; Skiffen%ga 6; ; 553 03 J'nk' ping; (+46) 36 - 10 06 60; (+46) 36 - 16 07 54; mwidell@metabo.dk
Sverige; HDF - Bolagen AB; Svarvaregatan 5; P.O.Box 525; 30180 Halmstad; (+46) 35 - 154400; (+46) 35 - 104835; bo.rosenbaum@hdf.se
Thailand; SSM - Sri Siam Mongkol Co., Ltd; 1570-1576 Krung Kasem RD.; ; Pomprab Bangkok 10100; (+66) 2 - 3 28 11 89; (+66) 2 - 3 28 13 04; vlnai@ssm.co.th
Tunisia; L'Équipement Moderne; 86, Ave. de Carthage; ; 1000 Tunis; (+216) 1 - 25 83 92; (+216) 1 - 35 18 45; equipement-moderne@planet.tn
Turkey; Buria A.S.; Yoyvoda Cad. 61-65; ; 80003 Karak' y-Istanbul; (+90) 212 - 2 56 49 50; (+90) 212 - 2 38 98 26; elalet@buria.com
Ukraine; Comservice; Ukrainian-Russian Joint Venture 2; Narodnogo Opolchenyaya; 03 151 Kiev; (+380) 44 - 2 45 94 34; (+380) 44 - 2 45 93 65; comserv@ukrmet.net
United Arab Emirates; Sedana Trading Co; P.O. Box 1919; ; Sharjah; (+971) 6 - 533 05 51; (+971) 6 - 533 73 68; sedana@emirates.net.ae
Venezuela; OLY-COPIA C.A.; 3 ra Transversal Los Ruices; Edificio Principal II, Piso 4; Caracas 1071; (+58) 212 - 2 37 30 22; (+58) 212 - 2 39 23 65; masmus@olycopia.com
Vietnam; HIU HINH MACHINERY CO., LTD.; 157-159 Xuan Hong Street, Ward 12; Tan Binh District; Ho Chi Minh City; (+84) 8 - 811 74 54; (+84) 8 - 811 63 38; TVTLinh@hcm.fpt.vn
Yugoslavia; WHM WOBY HAUS MARKT; Brace Ribnikara 55; ; 21000 Novi Sad; (+38) 12 15 28 56; (+38) 12 15 24 57; woby@Eumet.yu